Image 2

AF/1700

Please type a plus sign (+) inside this box → ☒

PTO/SB/21 (08-00)
Approved for use through 10/31/2002. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages In This Submission:

Application Number	09/804,791
Filing Date	13 March 2001
First Named Inventor	Merrette, Michele M. et al.
Group Art Unit	1731
Examiner Name	Chin, Peter
Attorney Docket Number	1920

ENCLOSURES *(check all that apply)*

☒ Fee Transmittal Form	☐ Assignment Papers	☐ After Allowance Communication
☐ Fee Attached	*(for an Application)*	to Group
☐ Amendment / Reply	☐ Drawing(s)	☐ Appeal Communication to
☐ After Final	☐ Licensing-related Papers	Board of Appeals and Interferences
☐ Affidavits/declarations(s)	☐ Petition	☒ Appeal Communication to
☐ Extension of Time Request	☐ Petition to Convert to a	Group *(Appeal, Notice, Brief, Reply*
☐ Express Abandonment Request	Provisional Application	*Brief)*
☐ Information Disclosure Statement	☐ Power of Attorney, Revocation	☐ Proprietary Information
☐ Certified Copy of Priority Doc(s)	Change of Correspondence	☐ Status Letter
☐Response to Missing	Address	☒ Other Enclosure(s) *(please*
Parts/Incomplete Application	☐ Terminal Disclaimer	*identify below):*
☐ Response to Missing Parts	☐ Request for Refund	Postcard Receipt
Under 37 CFR 1.52 or 1.53	☐ CD, Number of CD(s)____	

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual Name -	**David P. LeCroy, Reg. No. 37,869**
Signature –	
Date -	**October 06, 2003**

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, DC 20231 on this date: **10/06/03**

Typed or Printed Name	Deborah J. Mouzon		
Signature		**Date**	10/06/03

#40814

PTO/SB/17 (08-03)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 320.00

Complete if Known	
Application Number	09/804,791
Filing Date	13 March 2001
First Named Inventor	Merrette, Michele M. et al.
Examiner Name	Chin, Peter
Art Unit	1731
Attorney Docket No.	1920

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account:

Deposit Account Number: 14-0455

Deposit Account Name: National Starch & Chemical

The Director is authorized to: *(check all that apply)*

☒ Charge fee(s) indicated below ☒ Credit any overpayments

☐ Charge any additional fee(s) during the pendency of this application

☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Extra Claims		Fee from below	Fee Paid
Total Claims		-20** =		X =
Independent Claims		- 3** =		X =
Multiple Dependent				=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

***or number previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	320.00
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 320.00

SUBMITTED BY

Name (Print/Type)	David P. LeCroy	Registration No. (Attorney/Agent)	37,869	Telephone	908-685-5433
Signature				Date	10/06/03

(Complete *(if applicable)*)

WARNING: Information on this form may become public. Credit card information should not be included in this form. Provide credit card information and authorization on PTO-2038.

This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Box AF
Appeal Brief Under 37 C.F.R. § 1.192

PATENT APPLICATION
Attorney Docket No. 1920

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS:	MERRETTE, Michele M. *et al.*		
SERIAL NO.:	09/804 791	**GROUP ART UNIT:**	1731
FILED:	13 March 2001	**EXAMINER:**	CHIN, Peter
ENTITLED:	STARCHES FOR USE IN PAPERMAKING		

CERTIFICATE of MAILING UNDER 37 C.F.R. § 1.8

I hereby certify that this correspondence and any attachments referred to therein is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Box AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on **Monday, 6 October 2003**.

10/09/2003 DTESSEM1 00000066 140455 09804791
01 FC:1402 330.00 DA

Deborah J. Mouzon

Box AF
Commissioner for Patents
Post Office Box 1450
Alexandria, Virginia 22313-1450

APPELLANTS BRIEF UNDER 37 C.F.R. § 1.192

Dear Sir:

In compliance with the requirements of 37 C.F.R. § 1.192(c), Appellants respectfully submit their brief (in triplicate) in furtherance of the Notice of Appeal, which was mailed to the United States Patent and Trademark Office on 5 August 2003. As 5 October 2003 falls on a Sunday, this submission is timely for the purpose of not having to pay extension fees.

I. REAL PARTY IN INTEREST

National Starch and Chemical Investment Holding Corporation, Post Office Box 7663, Wilmington, Delaware 19803-7663, is the owner of the entire right, title and interest in and to the invention described in this patent application by virtue of an Assignment from the inventors, which Assignment was recorded in the United States Patent and Trademark Office on 24 May 2001 at Reel 011835, Frame 0400.

II. RELATED APPEALS AND INTERFERENCES

With respect to other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on, the Board's decision in this appeal, there are no such appeals or interferences.

III. STATUS OF CLAIMS

Claims 2-31 are pending in this application. Claims 2-31 stand rejected. No claims have been allowed.

The claims on appeal are Claims 2-31, which are set forth in the attached Appendix.

IV. STATUS OF AMENDMENTS

All claims stand as amended in Applicant's Reply of 14 February 2003, filed under 37 C.F.R. § 1.111, and as entered in the Examiner's Final Action of 6 May 2003. The Examiner's Final Action and his Advisory Actions of 8 July 2003 and 26 August 2003 indicate that only claims 2-29 are pending. Applicant's 14 February 2003 Reply introduced claims 30 and 31. There is no indication that these two claims should not be entered into the record. It is Applicant's belief that the Examiner's indication that only claims 2-29 are pending is simply a typographically error, and that the record should correctly reflect that claims 2-31 are pending.

V. SUMMARY OF INVENTION

The following summary of the invention is offered to enable the Board to more quickly determine where in the application enabling embodiments of the claimed subject matter are

described. However, because other embodiments may fall within the scope of the claims, this summary should not be construed as limiting of the claims hereafter discussed. *See* M.P.E.P. § 1206 (noting compliance with 37 C.F.R. § 1.192(c)(5), requiring specific reference to the specification in summarizing the invention, does not limit the claims).

The present invention generally discloses starch based paper additives that can be prepared without the need for high temperatures, high-pressure steam or long cooking times. These modified starch additives are degraded, inhibited and cationized (Specification: p. 5, lines 20-21). Starch degradation can be performed by any number of various means such as heat and/or acid degradation, enzymatic degradation, catalytic degradation and thermal degradation. Preferably the degradation occurs before inhibition and cationization (Specification: p. 6, lines 8-19). Typical levels of degradation can be in the water fluidity range of between about 15 and about 85 (Specification: p. 6, lines 15-17).

The starch can be physically or chemically inhibited. When chemically inhibited, the starch can be treated with any of a number of inhibition agents, including etherifying and/or esterfying agents such as epichlorohydrin, phosphorus oxychloride, sodium trimetaphosphate and adipic acetic anhydrides (Specification: p. 6, line 20 – p. 7. line 12). The level of inhibition is critical to the present invention, with typical chemical treatments in the range of about 0.001% to about 0.05% by weight of dry starch, preferably between about 0.002% and about 0.0125% by weight of dry starch (Specification: p. 7, lines 13-15).

The starch used in the present invention is also cationically treated. Cationization can occur by reacting the starch with reagents containing, for example, amino, imino, ammonium, sulfonium or phosphonium groups (Specification: p. 8, line 3 – p. 9, line 23). The amount of cationic substituent on the starch can vary, with a degree of substitution between about 0.005 and about 0.5 typically used (Specification: p. 9, line 24 – p. 10, line 2). In addition to the cationic group, the starch of the present invention may contain other derivatives (Specification: p. 10, lines 3-7).

The steps in preparing the degraded, inhibited, cationized starch can occur in any order. However, it is preferred that the starch is degraded before being inhibited and cationized (Specification: p. 10, lines 10-16). In such instance, a starch composition useful in preparing the degraded, inhibited, cationized starch of the present invention should include a degraded starch,

an inhibition agent in an amount of about 0.001% to about 0.05% by weight of dry starch, and a cationization derivative or reagent.

As previously pointed out, it is noted that the foregoing summary of the invention has been provided only for purposes of aiding the Board in locating at least an exemplary embodiment of the claimed subject matter within the specification. However, in order to summarize, other possible embodiments as may exist within the specification may have been omitted. Compliance with this requirement, therefore, should not be applied to limit the claims.

VI. ISSUES

The issues involved in this Appeal are:

(a) Whether Claims 2-31 are unpatentable under 35 U.S.C. § 103(a) over International Publication No. WO 97/46591 to Neale *et al.* ("Neale") in view of U.S. Patent No. 3,884,909 to Kightlinger *et al.* ("Kightlinger").

VII. GROUPING OF CLAIMS

Each of appealed Claims 2-31 stands or falls together on their merits.

VIII. APPELLANT'S ARGUMENTS

A. REJECTIONS FOR OBVIOUSNESS UNDER 35 U.S.C. § 103(a)

Claims 2-31 are rejected under 35 U.S.C. § 103(a) as being unpatentable over International Application No. WO 97/46591 to Neale *et al.* ("Neale") in view of U.S. Patent No. 3,884,909 to Kightlinger *et al.* ("Kightlinger"). Specifically, the Examiner states –

> Neale et al relates to a granular crosslinked cationic starch added as swollen granules at the wet end of papermaking, i.e., furnish to improve strength of the paper. The swollen crosslinked cationic starch has a viscosity of less than 400 and preferably less than 50 cps, page 2. The crosslinking agent in Neale et al (page 3) is the same as the inhibiting agent of the present invention. The cross linking agent is used in an amount of at least 0.05% by weight of the starch. Degraded starch can be used, page 4 where, acid, alkali or enzyme treated starch are disclosed as suitable base starch for modification.
>
> Kightlinger et al discloses a depolymerized or degraded crosslinked cationic starch in granular form. The modified starch is added in the wet end of paper making, i.e., internal addition. The modified starch has superior retention, in addition to other properties of cationic starch such as strength. Thus, it would

have been obvious to optimize the degree of degradation of the starch would achieve the optimum retention and strength. Inherently, the claimed viscosity would be inherently be present. . . .

. . . . Applicants' arguments have been considered but are deemed unpersuasive of patentability. The arguments are premised on the difference in the nature of the crosslinking between the Neale et al and Kightlinger et al. The rejection is not based on the crosslinking process in Kightlinger et al but rather on the selection of degraded starch as the form of starch to be used in Neale et al. It is again noted that Neale et al discloses degraded starch as one of the starches that can be used. Kightlinger et al was merely cited to reinforce the selection of degraded starch as the starch to be used in Neale et al. . . .

. . . . The affidavit [and] request for reconsideration has been considered but does NOT place the application in condition for allowance because: *Claims 13, 19 and 22 are not commensurate with the arguments. The claims do not state that the modified degraded starch is to the extent that the gel point temperature is lower than the uninhibited starch to any specific degree by "unique combination of [degradation] and crosslinking within a specified range" . . . to produce improved paper stength (sic, strength) without partcle size range.*

1. The Standard for Obviousness

As the Federal Circuit has stated, "[t]he test of obviousness vel non is statutory". *In re Ochiai*, 71 F.3d 1565, 1569 (Fed. Cir. 1995). In order to sustain the Examiner's rejections, this Board must find that the *claimed* subject matter, taken "as a whole", would have "been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains". 35 U.S.C. § 103(a).

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

"There are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art." *In re Rouffet,* 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (The combination of the references taught every element of the claimed invention, however without a motivation to combine, a rejection based on a *prima facie* case of obvious was held improper.). The level of skill in the art cannot be relied upon to provide the suggestion to combine references. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999).

"In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification." *In re Linter*, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972).

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." *In re Kotzab,* 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

2. The Scope and Content of the Prior Art

Neale discloses crosslinked cationic starches useful in papermaking. The modified starch is prepared by swelling a cationized crosslinked starch under conditions selected so that the viscosity of the swollen product is less than 400 cps (Abstract). According to Neale, starches that can be cross-linked include "all types of native starches, premodified starches or hybrids thereof." These include potato, maize, tapioca, wheat, rice, waxy maize and high amylose maize (p. 4, lines 2-7).

The starch is modified by crosslinking the starch with an agent such as sodium trimetaphosphate ("STMP"), phosphorus oxychloride and epichlorohydrin, with STMP being preferred (p. 3, lines 25-30; *see also*, p. 5, 'Best Mode of Carrying Out the Invention', and Examples A-C). The amount of cross-linking agent used is 0.05% or more by weight of starch, with 0.05% to 1.0% being most preferred (p. 3, line 31 – p. 4, line1; 1.0% exemplified in all Examples). According to Neale, this high level of cross-linking agent is required in the invention in order to prevent over-swelling or rupturing, thereby obtaining modified starches with gel point ranges that are much higher (95-100°C) than the unmodified starch (55-65°C) (p. 3, lines 21-23; Table 1; p. 6, line 35 – p. 7, line 1). Neale teaches that high or strong cross-linking is critical in order to keep the granules intact (p. 6, lines 29-32). By highly crosslinking the starch, it does not gel at the wet end of the papermaking process but instead gels when heated over dryers (p. 5, lines 23-25; p. 6, lines 32-33).

The starch is cationized either subsequent to the cross-linking step or concurrent with the crosslinking step, with subsequent cationization being preferred (p. 4, lines 10-12; p. 3, lines 3-5). The cationization reagents include quaternary amine derivatives (p. 4, lines 13-16).

Although Neale includes potato as one of the starches useful for his invention, he notes that the average particle size of potato starch modified according to his invention is 99.8 μ (*see*, p. 7, Table 2 of Neale). Neale then states that 75% of the swollen starch should be within a particle size range of 15 to 90 microns, and that granules greater than 90 microns "tend to be too sparsely spread throughout the paper sheet to provide a uniform strength" (p. 9, lines 8-13; see also, p. 10, Table 4 and lines 3-9).

Neale teaches a gel point temperature range of the modified starch that is higher than that of the unmodified starch (*see*, p. 6, Table 1). According to Neale, this is preferred because it prevents the starch granules from rupturing, bursting or cooking out in the wet end application (p. 6, lines 29-33). Neale further teaches swelling the modified granules by heating them, *e.g.*, in a jet cooker at 70°C (*see*, p. 5, 'Best Mode of Carrying Out Invention', lines 19-20), and then adding these swollen granules to the paper pulp at the wet end stage (p. 5, lines 20-25). According to Neale, an effective amount of modified starch to add to the pulp should be between 1.0% and 10.0% based on the weight of dry fiber (p. 5, lines 20-22). As exemplified, Neale

discloses amounts of 3.7% (Example A), 3.8% (Example B), 3.5% (Experimental Trial A) and 3.01% (Experimental Trial B).

Accordingly, Neale teaches modified cationic starches that are strongly crosslinked in order to keep the granules intact, and thereby enhance their performance. As such, one skilled in the art would not be lead to believe that a starch that has been highly degraded and inhibited within a limit much lower than that taught by Neale (for the present invention, about 0.001% to about 0.05% by weight of dry starch) would produce granules that can rupture and gel at a temperature lower than the temperature of the base starch, resulting in a product with improved paper strength.

Kightlinger is cited simply for the selection of degraded starch as the starch to be used in Neale. Referring to Kightlinger therein is disclosed a gelatinizable cross-linked cationic starch and a method for its manufacture. This modified starch is produced by (step 1) reacting a starch with an alkali-catalyzable crosslinking agent and the reaction product of the crosslinking agent with ammonia or with an amine, and then (step 2) depolymerizing (degrading) the resulting cationic crosslinked product (Abstract; col. 2, lines 5-9). Without the subsequent depolymerization (degradation) step, the residual crosslinker in the first step will cause normally unwanted high crosslinking to occur (*see*, col. 6, lines 26-33, *esp.* lines 29-31 – ". . . depending upon the degree of crosslinking, might even be substantially incapable of gelatinization").

The depolymerization step avoids additional processing costs associated with removing the excess crosslinker, bringing the modified cationic starch back to a viscosity normally seen with other starches (*see*, col. 1, line 54 – col. 2, line 4). The amount of depolymerization is directly related to the extent of crosslinking undergone by the starch in the first step of the process (col. 6, lines 51-57). Accordingly, Kightlinger provides no unique viscosity range for superior performance.

Kightlinger claims a wide variety of starches for use in the process of the invention, including corn, potato, tapioca, wheat, waxy sorghum, waxy maize, grain sorghum, and rice, all of which can be modified or unmodified (col. 2, lines 60-68). Preferred crosslinkers for use in the Neale invention include 1,3-dichloro-2-propanol, 1,4-dichlorobutene-2 and epichlorohydrin (col. 4, lines 2-4). The amount of crosslinking agent used should be enough to produce a cationic intermediate starch product that, prior to depolymerization, has a Sedimentation Value ('SV') of

from about 81 to about 98 (col. 4, lines 5-24). Suitable cationic reagents include alkali metal hydroxides and quaternary ammonium bases, of which sodium hydroxide is preferred (col. 5, lines 40-48).

In summary, starch products produced by the process of Kightlinger are first crosslinked and/or cationized, and then degraded. Kightlinger does not teach or suggest a particular viscosity range for enhanced performance. Further, Kightlinger does not teach or suggest a range of inhibition.

3. The Cited Art Fails to Render Obvious the Claims of the Present Invention

As noted in the 'Summary of the Invention' above, the level of inhibition is critical to the present invention, with typical chemical treatments in the range of about 0.001% to about 0.05% by weight of dry starch. Neither of the above-cited references teaches nor suggests this level of inhibition, claimed in independent claims 13, 19 and 22 of the present application and their corresponding dependent claims. Specifically, neither reference teaches or suggests the degraded, inhibited, cationic starch, the degraded starch composition, nor a process for preparing the degraded, inhibited, cationic starch claimed therein.

Although Neale generally claims that any premodified starch can be used (p. 4, lines 4-6), one skilled in the art would recognize that degrading a starch prior to crosslinking will not provide a modified starch having a gel temperature higher than the unmodified base. (Kightlinger degrades after modifying the starch.) This is supported by the Tsai Declaration and the experimental data provided therein. The starches of that Declaration were inhibited within the presently claimed amount. The Declaration data clearly shows that both a nondegraded modified starch (Starch 3, crosslinked to about 0.05% by weight) and a degraded starch (Starch 2, crosslinked to about 0.03% by weight) do NOT have a gel point temperature range greater than the unmodified starch (Starch 1). This is in contrast to Table 1 of Neale, wherein it is shown that the gel point temperature range of the modified starch is much higher than that of the unmodified starch. This can only be done by highly crosslinking the starch. Neale desires this high gel temperature of the modified starch so that starch added to the wet-end stage will not gel. Instead, this modified starch gels only when it is subjected to the higher temperatures of the dryers.

In contrast, Appellants have shown that modified degraded starches inhibited within the claimed range of the present invention. result in a starch wherein the gel point temperature is lower than the uninhibited starch. (See p. 8 of Appellants' 17 June 2003 Reply with reference to the Tsai Declaration therein as noted above – ". . . both a nondegraded modified starch (Starch 3, as exemplified in Neale with the exception being the amount of crosslinker) and a degraded starch (Starch 2 as presently claimed), **when inhibited in the amount claimed**, do NOT have a gel point temperature range greater than the unmodified starch (Starch 1)" (emphasis added).) Accordingly, by claiming this specified range of inhibition agent, which is not taught or suggested by any of the art cited, the claims do indeed "state that the modified degraded starch is to the extent that the gel point temperature is lower than the uninhibited starch to any specific degree by 'unique combination of [degradation] and crosslinking within a specified range' [] to produce improved paper strength without particle size range".

For all the foregoing reasons, the Examiner has failed to establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a) of any of claims 2-31 over Neale in view of Kightlinger. Accordingly, the rejections under 35 U.S.C. § 103(a) should be reversed.

IX. CONCLUSION

For the reasons mentioned above, Appellant's degraded, inhibited, cationic starch, the process for preparing the degraded, inhibited, cationic starch, and the starch composition is not made obvious over Neale in view of Kightlinger as neither reference teaches a degraded starch that is inhibited in an amount of about 0.001% to about 0.05% by weight of dry starch.

For all of the foregoing reasons, it is respectfully submitted that the final rejection of all claims is untenable and should not be sustained. Allowance of the claims is believed to be in order, and such allowance is respectfully requested.

Respectfully submitted,

Dated: 30 October 2003

NATIONAL STARCH AND CHEMICAL COMPANY
10 Finderne Avenue
Bridgewater, New Jersey 08807
Phone 908.685.5433
Fax 908.707.3706

David P. LeCroy
Attorney for Applicants
Reg. No. 37,869

APPENDIX A

Claims of U.S. Application No. 09/804 791

1. (Canceled)

2. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the final peak viscosity of said starch is about 110 to about 1000 percent of a non-inhibited degraded cationized starch viscosity.

3. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the starch is chosen from the group consisting of corn, tapioca, potato and sago and their waxy and high amylose versions thereof.

4. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the starch is inhibited chemically.

5. (Previously amended) The degraded, inhibited, cationic starch of claim 4 wherein the starch is inhibited with epichlorohydrin.

6. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the starch is inhibited thermally.

7. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the degraded starch has a WF of about 15 to 85.

8. (Previously amended) The degraded, inhibited, cationic starch of claim 7 wherein the degraded starch has a WF of about 20 to 70.

9. (Previously amended) The degraded, inhibited, cationic starch of claim 8 wherein the degraded starch has a WF of about 35 to 65.

10. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the cationic group is a quaternary ammonium derivative.

11. (Previously amended) The degraded, inhibited, cationic starch of claim 20 wherein the degraded, cationic, inhibited starch has a peak viscosity of less than 250 centipoise.

12. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the starch is modified to contain a quaternary amine.

13. (Previously amended) A process for preparing a degraded, inhibited, cationic starch comprising the steps of:

degrading the molecular weight of a native starch,

inhibiting the degraded starch with an inhibition agent in an amount of about 0.001% to about 0.05% by weight of dry starch, and

chemically modifying the degraded starch with a cationic reagent,

wherein the steps of inhibiting and chemically modifying the degraded starch with a cationic reagent occur concurrently with or subsequently to one another.

14. (Original) The process of claim 13, wherein the inhibition is produced thermally.

15. (Previously amended) A process for making paper comprising the steps of adding the starch of claim 19 to a papermaking system.

16. (Previously amended) The process of claim 15 wherein the starch is added in granular form.

17. (Previously amended) A paper article comprising the starch of claim 19.

18. (Previously amended) A paper article comprising the starch produced by the process of claim 13.

19. (Previously amended) A degraded, inhibited, cationic starch prepared by degrading a starch, inhibiting the degraded starch with an inhibition agent in an amount of about 0.001% to about 0.05% by weight of dry starch, and cationically treating the starch,

wherein the steps of inhibiting and cationically treating the starch occur concurrently with or subsequently to one another.

20. (Original) The degraded, inhibited, cationic starch of claim 19 wherein the final peak viscosity of the starch is less than about 500 centipoise.

21. (Original) The degraded, inhibited, cationic starch of claim 2 wherein the final peak viscosity of the starch is about 130 to about 800 percent of the viscosity of the non-inhibited degraded cationic starch.

22. (Previously amended) A modified starch composition comprising:

a degraded starch,

an inhibition agent in an amount of about 0.001% to about 0.05% by weight of dry starch, and

a cationization derivative.

23. (Original) The modified starch composition of claim 22 wherein the starch is degraded to a water fluidity of about 15 to about 85.

24. (Original) The modified starch composition of claim 23 wherein the starch is degraded to a water fluidity of about 20 to about 70.

25. (Previously amended) The modified starch composition of claim 24 wherein the starch is degraded to a water fluidity of about 35 to about 65.

26. (Original) The modified starch composition of claim 22 wherein the inhibition agent is provided in an amount of about 0.002% to about 0.0125% by weight of dry starch.

27. (Original) Paper made from the modified starch composition of claim 22.

28. (Original) The paper of claim 27 comprising about 0.05% to about 5.0% by weight of the modified starch composition based on the dry weight of the pulp.

29. (Original) The paper of claim 28 comprising about 0.1% to about 2.0% by weight of the modified starch composition based on the dry weight of the pulp.

30. (Original) The modified starch composition of claim 22 wherein the final peak viscosity of the composition is less than about 500 centipoise.

31. (Original) The modified starch composition of claim 22 wherein the final peak viscosity of the composition is about 110 to about 1000 percent of the non-inhibited starch composition.

Box AF
Appeal Brief Under 37 C.F.R. § 1.192

PATENT APPLICATION
Attorney Docket No. 1920

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS:	MERRETTE, Michele M. *et al.*		
SERIAL NO.:	09/804 791	**GROUP ART UNIT:**	1731
FILED:	13 March 2001	**EXAMINER:**	CHIN, Peter
ENTITLED:	STARCHES FOR USE IN PAPERMAKING		

CERTIFICATE of MAILING UNDER 37 C.F.R. § 1.8

I hereby certify that this correspondence and any attachments referred to therein is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Box AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on **Monday, 6 October 2003**.

Deborah Mouzon

Box AF
Commissioner for Patents
Post Office Box 1450
Alexandria, Virginia 22313-1450

APPELLANTS BRIEF UNDER 37 C.F.R. § 1.192

Dear Sir:

In compliance with the requirements of 37 C.F.R. § 1.192(c), Appellants respectfully submit their brief (in triplicate) in furtherance of the Notice of Appeal, which was mailed to the United States Patent and Trademark Office on 5 August 2003. As 5 October 2003 falls on a Sunday, this submission is timely for the purpose of not having to pay extension fees.

I. REAL PARTY IN INTEREST

National Starch and Chemical Investment Holding Corporation, Post Office Box 7663, Wilmington, Delaware 19803-7663, is the owner of the entire right, title and interest in and to the invention described in this patent application by virtue of an Assignment from the inventors, which Assignment was recorded in the United States Patent and Trademark Office on 24 May 2001 at Reel 011835, Frame 0400.

II. RELATED APPEALS AND INTERFERENCES

With respect to other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on, the Board's decision in this appeal, there are no such appeals or interferences.

III. STATUS OF CLAIMS

Claims 2-31 are pending in this application. Claims 2-31 stand rejected. No claims have been allowed.

The claims on appeal are Claims 2-31, which are set forth in the attached Appendix.

IV. STATUS OF AMENDMENTS

All claims stand as amended in Applicant's Reply of 14 February 2003, filed under 37 C.F.R. § 1.111, and as entered in the Examiner's Final Action of 6 May 2003. The Examiner's Final Action and his Advisory Actions of 8 July 2003 and 26 August 2003 indicate that only claims 2-29 are pending. Applicant's 14 February 2003 Reply introduced claims 30 and 31. There is no indication that these two claims should not be entered into the record. It is Applicant's belief that the Examiner's indication that only claims 2-29 are pending is simply a typographically error, and that the record should correctly reflect that claims 2-31 are pending.

V. SUMMARY OF INVENTION

The following summary of the invention is offered to enable the Board to more quickly determine where in the application enabling embodiments of the claimed subject matter are

described. However, because other embodiments may fall within the scope of the claims, this summary should not be construed as limiting of the claims hereafter discussed. *See* M.P.E.P. § 1206 (noting compliance with 37 C.F.R. § 1.192(c)(5), requiring specific reference to the specification in summarizing the invention, does not limit the claims).

The present invention generally discloses starch based paper additives that can be prepared without the need for high temperatures, high-pressure steam or long cooking times. These modified starch additives are degraded, inhibited and cationized (Specification: p. 5, lines 20-21). Starch degradation can be performed by any number of various means such as heat and/or acid degradation, enzymatic degradation, catalytic degradation and thermal degradation. Preferably the degradation occurs before inhibition and cationization (Specification: p. 6, lines 8-19). Typical levels of degradation can be in the water fluidity range of between about 15 and about 85 (Specification: p. 6, lines 15-17).

The starch can be physically or chemically inhibited. When chemically inhibited, the starch can be treated with any of a number of inhibition agents, including etherifying and/or esterfying agents such as epichlorohydrin, phosphorus oxychloride, sodium trimetaphosphate and adipic acetic anhydrides (Specification: p. 6, line 20 – p. 7. line 12). The level of inhibition is critical to the present invention, with typical chemical treatments in the range of about 0.001% to about 0.05% by weight of dry starch, preferably between about 0.002% and about 0.0125% by weight of dry starch (Specification: p. 7, lines 13-15).

The starch used in the present invention is also cationically treated. Cationization can occur by reacting the starch with reagents containing, for example, amino, imino, ammonium, sulfonium or phosphonium groups (Specification: p. 8, line 3 – p. 9, line 23). The amount of cationic substituent on the starch can vary, with a degree of substitution between about 0.005 and about 0.5 typically used (Specification: p. 9, line 24 – p. 10, line 2). In addition to the cationic group, the starch of the present invention may contain other derivatives (Specification: p. 10, lines 3-7).

The steps in preparing the degraded, inhibited, cationized starch can occur in any order. However, it is preferred that the starch is degraded before being inhibited and cationized (Specification: p. 10, lines 10-16). In such instance, a starch composition useful in preparing the degraded, inhibited, cationized starch of the present invention should include a degraded starch,

an inhibition agent in an amount of about 0.001% to about 0.05% by weight of dry starch, and a cationization derivative or reagent.

As previously pointed out, it is noted that the foregoing summary of the invention has been provided only for purposes of aiding the Board in locating at least an exemplary embodiment of the claimed subject matter within the specification. However, in order to summarize, other possible embodiments as may exist within the specification may have been omitted. Compliance with this requirement, therefore, should not be applied to limit the claims.

VI. ISSUES

The issues involved in this Appeal are:

(a) Whether Claims 2-31 are unpatentable under 35 U.S.C. § 103(a) over International Publication No. WO 97/46591 to Neale *et al.* ("Neale") in view of U.S. Patent No. 3,884,909 to Kightlinger *et al.* ("Kightlinger").

VII. GROUPING OF CLAIMS

Each of appealed Claims 2-31 stands or falls together on their merits.

VIII. APPELLANT'S ARGUMENTS

A. REJECTIONS FOR OBVIOUSNESS UNDER 35 U.S.C. § 103(a)

Claims 2-31 are rejected under 35 U.S.C. § 103(a) as being unpatentable over International Application No. WO 97/46591 to Neale *et al.* ("Neale") in view of U.S. Patent No. 3,884,909 to Kightlinger *et al.* ("Kightlinger"). Specifically, the Examiner states –

> Neale et al relates to a granular crosslinked cationic starch added as swollen granules at the wet end of papermaking, i.e., furnish to improve strength of the paper. The swollen crosslinked cationic starch has a viscosity of less than 400 and preferably less than 50 cps, page 2. The crosslinking agent in Neale et al (page 3) is the same as the inhibiting agent of the present invention. The cross linking agent is used in an amount of at least 0.05% by weight of the starch. Degraded starch can be used, page 4 where, acid, alkali or enzyme treated starch are disclosed as suitable base starch for modification.
>
> Kightlinger et al discloses a depolymerized or degraded crosslinked cationic starch in granular form. The modified starch is added in the wet end of paper making, i.e., internal addition. The modified starch has superior retention, in addition to other properties of cationic starch such as strength. Thus, it would

have been obvious to optimize the degree of degradation of the starch would achieve the optimum retention and strength. Inherently, the claimed viscosity would be inherently be present. . . .

. . . . Applicants' arguments have been considered but are deemed unpersuasive of patentability. The arguments are premised on the difference in the nature of the crosslinking between the Neale et al and Kightlinger et al. The rejection is not based on the crosslinking process in Kightlinger et al but rather on the selection of degraded starch as the form of starch to be used in Neale et al. It is again noted that Neale et al discloses degraded starch as one of the starches that can be used. Kightlinger et al was merely cited to reinforce the selection of degraded starch as the starch to be used in Neale et al. . . .

. . . . The affidavit [and] request for reconsideration has been considered but does NOT place the application in condition for allowance because: *Claims 13, 19 and 22 are not commensurate with the arguments. The claims do not state that the modified degraded starch is to the extent that the gel point temperature is lower than the uninhibited starch to any specific degree by "unique combination of [degradation] and crosslinking within a specified range" . . . to produce improved paper stength (sic, strength) without partcle size range.*

1. The Standard for Obviousness

As the Federal Circuit has stated, "[t]he test of obviousness vel non is statutory". *In re Ochiai*, 71 F.3d 1565, 1569 (Fed. Cir. 1995). In order to sustain the Examiner's rejections, this Board must find that the *claimed* subject matter, taken "as a whole", would have "been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains". 35 U.S.C. § 103(a).

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

"There are three possible sources for a motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art." *In re Rouffet,* 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (The combination of the references taught every element of the claimed invention, however without a motivation to combine, a rejection based on a *prima facie* case of obvious was held improper.). The level of skill in the art cannot be relied upon to provide the suggestion to combine references. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999).

"In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification." *In re Linter*, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972).

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." *In re Kotzab,* 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

2. The Scope and Content of the Prior Art

Neale discloses crosslinked cationic starches useful in papermaking. The modified starch is prepared by swelling a cationized crosslinked starch under conditions selected so that the viscosity of the swollen product is less than 400 cps (Abstract). According to Neale, starches that can be cross-linked include "all types of native starches, premodified starches or hybrids thereof." These include potato, maize, tapioca, wheat, rice, waxy maize and high amylose maize (p. 4, lines 2-7).

The starch is modified by crosslinking the starch with an agent such as sodium trimetaphosphate ("STMP"), phosphorus oxychloride and epichlorohydrin, with STMP being preferred (p. 3, lines 25-30; *see also*, p. 5, 'Best Mode of Carrying Out the Invention', and Examples A-C). The amount of cross-linking agent used is 0.05% or more by weight of starch, with 0.05% to 1.0% being most preferred (p. 3, line 31 – p. 4, line1; 1.0% exemplified in all Examples). According to Neale, this high level of cross-linking agent is required in the invention in order to prevent over-swelling or rupturing, thereby obtaining modified starches with gel point ranges that are much higher (95-100°C) than the unmodified starch (55-65°C) (p. 3, lines 21-23; Table 1; p. 6, line 35 – p. 7, line 1). Neale teaches that high or strong cross-linking is critical in order to keep the granules intact (p. 6, lines 29-32). By highly crosslinking the starch, it does not gel at the wet end of the papermaking process but instead gels when heated over dryers (p. 5, lines 23-25; p. 6, lines 32-33).

The starch is cationized either subsequent to the cross-linking step or concurrent with the crosslinking step, with subsequent cationization being preferred (p. 4, lines 10-12; p. 3, lines 3-5). The cationization reagents include quaternary amine derivatives (p. 4, lines 13-16).

Although Neale includes potato as one of the starches useful for his invention, he notes that the average particle size of potato starch modified according to his invention is 99.8 μ (*see*, p. 7, Table 2 of Neale). Neale then states that 75% of the swollen starch should be within a particle size range of 15 to 90 microns, and that granules greater than 90 microns "tend to be too sparsely spread throughout the paper sheet to provide a uniform strength" (p. 9, lines 8-13; see also, p. 10, Table 4 and lines 3-9).

Neale teaches a gel point temperature range of the modified starch that is higher than that of the unmodified starch (*see*, p. 6, Table 1). According to Neale, this is preferred because it prevents the starch granules from rupturing, bursting or cooking out in the wet end application (p. 6, lines 29-33). Neale further teaches swelling the modified granules by heating them, *e.g.*, in a jet cooker at 70°C (*see*, p. 5, 'Best Mode of Carrying Out Invention', lines 19-20), and then adding these swollen granules to the paper pulp at the wet end stage (p. 5, lines 20-25). According to Neale, an effective amount of modified starch to add to the pulp should be between 1.0% and 10.0% based on the weight of dry fiber (p. 5, lines 20-22). As exemplified, Neale

discloses amounts of 3.7% (Example A), 3.8% (Example B), 3.5% (Experimental Trial A) and 3.01% (Experimental Trial B).

Accordingly, Neale teaches modified cationic starches that are strongly crosslinked in order to keep the granules intact, and thereby enhance their performance. As such, one skilled in the art would not be lead to believe that a starch that has been highly degraded and inhibited within a limit much lower than that taught by Neale (for the present invention, about 0.001% to about 0.05% by weight of dry starch) would produce granules that can rupture and gel at a temperature lower than the temperature of the base starch, resulting in a product with improved paper strength.

Kightlinger is cited simply for the selection of degraded starch as the starch to be used in Neale. Referring to Kightlinger therein is disclosed a gelatinizable cross-linked cationic starch and a method for its manufacture. This modified starch is produced by (step 1) reacting a starch with an alkali-catalyzable crosslinking agent and the reaction product of the crosslinking agent with ammonia or with an amine, and then (step 2) depolymerizing (degrading) the resulting cationic crosslinked product (Abstract; col. 2, lines 5-9). Without the subsequent depolymerization (degradation) step, the residual crosslinker in the first step will cause normally unwanted high crosslinking to occur (*see*, col. 6, lines 26-33, *esp.* lines 29-31 – ". . . depending upon the degree of crosslinking, might even be substantially incapable of gelatinization").

The depolymerization step avoids additional processing costs associated with removing the excess crosslinker, bringing the modified cationic starch back to a viscosity normally seen with other starches (*see*, col. 1, line 54 – col. 2, line 4). The amount of depolymerization is directly related to the extent of crosslinking undergone by the starch in the first step of the process (col. 6, lines 51-57). Accordingly, Kightlinger provides no unique viscosity range for superior performance.

Kightlinger claims a wide variety of starches for use in the process of the invention, including corn, potato, tapioca, wheat, waxy sorghum, waxy maize, grain sorghum, and rice, all of which can be modified or unmodified (col. 2, lines 60-68). Preferred crosslinkers for use in the Neale invention include 1,3-dichloro-2-propanol, 1,4-dichlorobutene-2 and epichlorohydrin (col. 4, lines 2-4). The amount of crosslinking agent used should be enough to produce a cationic intermediate starch product that, prior to depolymerization, has a Sedimentation Value ('SV') of

from about 81 to about 98 (col. 4, lines 5-24). Suitable cationic reagents include alkali metal hydroxides and quaternary ammonium bases, of which sodium hydroxide is preferred (col. 5, lines 40-48).

In summary, starch products produced by the process of Kightlinger are first crosslinked and/or cationized, and then degraded. Kightlinger does not teach or suggest a particular viscosity range for enhanced performance. Further, Kightlinger does not teach or suggest a range of inhibition.

3. The Cited Art Fails to Render Obvious the Claims of the Present Invention

As noted in the 'Summary of the Invention' above, the level of inhibition is critical to the present invention, with typical chemical treatments in the range of about 0.001% to about 0.05% by weight of dry starch. Neither of the above-cited references teaches nor suggests this level of inhibition, claimed in independent claims 13, 19 and 22 of the present application and their corresponding dependent claims. Specifically, neither reference teaches or suggests the degraded, inhibited, cationic starch, the degraded starch composition, nor a process for preparing the degraded, inhibited, cationic starch claimed therein.

Although Neale generally claims that any premodified starch can be used (p. 4, lines 4-6), one skilled in the art would recognize that degrading a starch prior to crosslinking will not provide a modified starch having a gel temperature higher than the unmodified base. (Kightlinger degrades after modifying the starch.) This is supported by the Tsai Declaration and the experimental data provided therein. The starches of that Declaration were inhibited within the presently claimed amount. The Declaration data clearly shows that both a nondegraded modified starch (Starch 3, crosslinked to about 0.05% by weight) and a degraded starch (Starch 2, crosslinked to about 0.03% by weight) do NOT have a gel point temperature range greater than the unmodified starch (Starch 1). This is in contrast to Table 1 of Neale, wherein it is shown that the gel point temperature range of the modified starch is much higher than that of the unmodified starch. This can only be done by highly crosslinking the starch. Neale desires this high gel temperature of the modified starch so that starch added to the wet-end stage will not gel. Instead, this modified starch gels only when it is subjected to the higher temperatures of the dryers.

In contrast, Appellants have shown that modified degraded starches inhibited within the claimed range of the present invention. result in a starch wherein the gel point temperature is lower than the uninhibited starch. (See p. 8 of Appellants' 17 June 2003 Reply with reference to the Tsai Declaration therein as noted above – ". . . both a nondegraded modified starch (Starch 3, as exemplified in Neale with the exception being the amount of crosslinker) and a degraded starch (Starch 2 as presently claimed), **when inhibited in the amount claimed**, do NOT have a gel point temperature range greater than the unmodified starch (Starch 1)" (emphasis added).) Accordingly, by claiming this specified range of inhibition agent, which is not taught or suggested by any of the art cited, the claims do indeed "state that the modified degraded starch is to the extent that the gel point temperature is lower than the uninhibited starch to any specific degree by 'unique combination of [degradation] and crosslinking within a specified range' [] to produce improved paper strength without particle size range".

For all the foregoing reasons, the Examiner has failed to establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a) of any of claims 2-31 over Neale in view of Kightlinger. Accordingly, the rejections under 35 U.S.C. § 103(a) should be reversed.

IX. CONCLUSION

For the reasons mentioned above, Appellant's degraded, inhibited, cationic starch, the process for preparing the degraded, inhibited, cationic starch, and the starch composition is not made obvious over Neale in view of Kightlinger as neither reference teaches a degraded starch that is inhibited in an amount of about 0.001% to about 0.05% by weight of dry starch.

For all of the foregoing reasons, it is respectfully submitted that the final rejection of all claims is untenable and should not be sustained. Allowance of the claims is believed to be in order, and such allowance is respectfully requested.

Respectfully submitted,

Dated: 30 October 2003

NATIONAL STARCH AND CHEMICAL COMPANY
10 Finderne Avenue
Bridgewater, New Jersey 08807
Phone 908.685.5433
Fax 908.707.3706

David P. LeCroy
Attorney for Applicants
Reg. No. 37,869

APPENDIX A

Claims of U.S. Application No. 09/804 791

1. (Canceled)

2. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the final peak viscosity of said starch is about 110 to about 1000 percent of a non-inhibited degraded cationized starch viscosity.

3. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the starch is chosen from the group consisting of corn, tapioca, potato and sago and their waxy and high amylose versions thereof.

4. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the starch is inhibited chemically.

5. (Previously amended) The degraded, inhibited, cationic starch of claim 4 wherein the starch is inhibited with epichlorohydrin.

6. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the starch is inhibited thermally.

7. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the degraded starch has a WF of about 15 to 85.

8. (Previously amended) The degraded, inhibited, cationic starch of claim 7 wherein the degraded starch has a WF of about 20 to 70.

9. (Previously amended) The degraded, inhibited, cationic starch of claim 8 wherein the degraded starch has a WF of about 35 to 65.

10. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the cationic group is a quaternary ammonium derivative.

11. (Previously amended) The degraded, inhibited, cationic starch of claim 20 wherein the degraded, cationic, inhibited starch has a peak viscosity of less than 250 centipoise.

12. (Previously amended) The degraded, inhibited, cationic starch of claim 19 wherein the starch is modified to contain a quaternary amine.

13. (Previously amended) A process for preparing a degraded, inhibited, cationic starch comprising the steps of:

degrading the molecular weight of a native starch,

inhibiting the degraded starch with an inhibition agent in an amount of about 0.001% to about 0.05% by weight of dry starch, and

chemically modifying the degraded starch with a cationic reagent,

wherein the steps of inhibiting and chemically modifying the degraded starch with a cationic reagent occur concurrently with or subsequently to one another.

14. (Original) The process of claim 13, wherein the inhibition is produced thermally.

15. (Previously amended) A process for making paper comprising the steps of adding the starch of claim 19 to a papermaking system.

16. (Previously amended) The process of claim 15 wherein the starch is added in granular form.

17. (Previously amended) A paper article comprising the starch of claim 19.

18. (Previously amended) A paper article comprising the starch produced by the process of claim 13.

19. (Previously amended) A degraded, inhibited, cationic starch prepared by degrading a starch, inhibiting the degraded starch with an inhibition agent in an amount of about 0.001% to about 0.05% by weight of dry starch, and cationically treating the starch,

wherein the steps of inhibiting and cationically treating the starch occur concurrently with or subsequently to one another.

20. (Original) The degraded, inhibited, cationic starch of claim 19 wherein the final peak viscosity of the starch is less than about 500 centipoise.

21. (Original) The degraded, inhibited, cationic starch of claim 2 wherein the final peak viscosity of the starch is about 130 to about 800 percent of the viscosity of the non-inhibited degraded cationic starch.

22. (Previously amended) A modified starch composition comprising:

a degraded starch,

an inhibition agent in an amount of about 0.001% to about 0.05% by weight of dry starch, and

a cationization derivative.

23. (Original) The modified starch composition of claim 22 wherein the starch is degraded to a water fluidity of about 15 to about 85.

24. (Original) The modified starch composition of claim 23 wherein the starch is degraded to a water fluidity of about 20 to about 70.

25. (Previously amended) The modified starch composition of claim 24 wherein the starch is degraded to a water fluidity of about 35 to about 65.

26. (Original) The modified starch composition of claim 22 wherein the inhibition agent is provided in an amount of about 0.002% to about 0.0125% by weight of dry starch.

27. (Original) Paper made from the modified starch composition of claim 22.

28. (Original) The paper of claim 27 comprising about 0.05% to about 5.0% by weight of the modified starch composition based on the dry weight of the pulp.

29. (Original) The paper of claim 28 comprising about 0.1% to about 2.0% by weight of the modified starch composition based on the dry weight of the pulp.

30. (Original) The modified starch composition of claim 22 wherein the final peak viscosity of the composition is less than about 500 centipoise.

31. (Original) The modified starch composition of claim 22 wherein the final peak viscosity of the composition is about 110 to about 1000 percent of the non-inhibited starch composition.